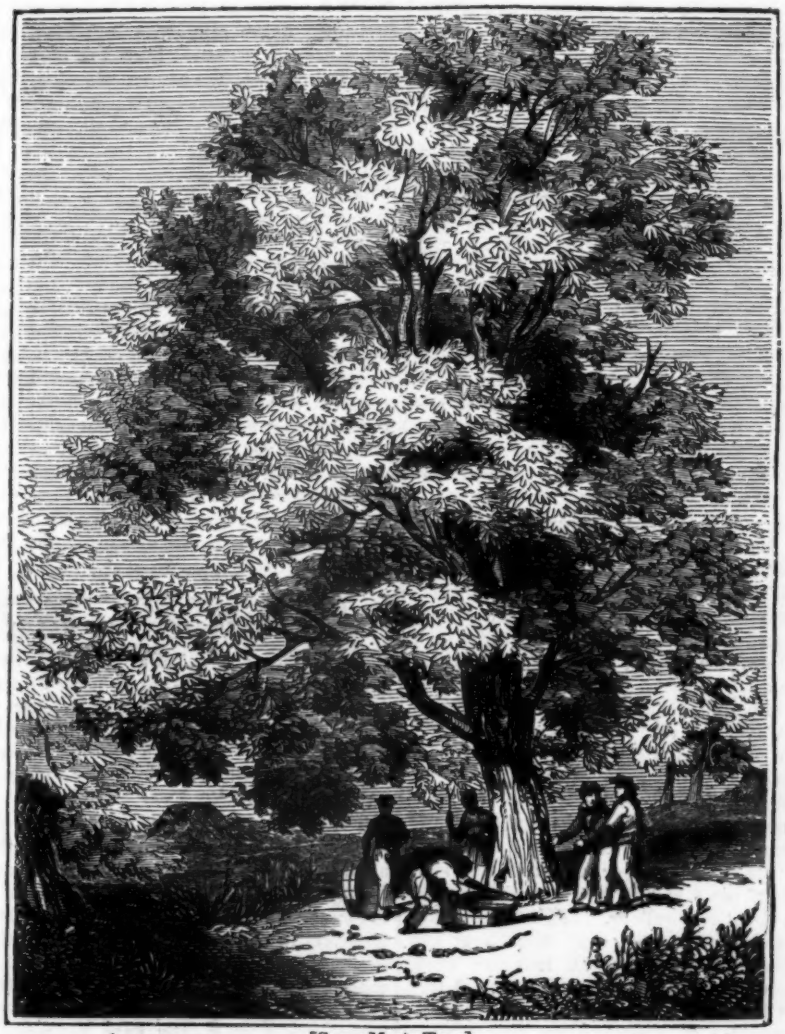
THE PENNY MAGAZINE

OF THE

Society for the Diffusion of Useful Knowledge.

194.] PUBLISHED EVERY SATURDAY. [APRIL 11, 1835.

MAPLE-TREE.



[Sugar-Maple Tree.]

MAPLE is the common name of the *acer* genus of plants, of which there are thirty-four species. Nine of these belong to North America, twelve to Europe, six of great beauty to Japan, and the rest to different parts of Asia. The timber of the maple is not adapted for works of durability and strength; but, from the beauty of its texture, it is peculiarly fitted for ornamental purposes; and the variety called "curled maple" is, on this account, held in great esteem. It is capable of being highly polished, and is sometimes employed with good effect in inlaying; but is most commonly used for the stocks of fowling-pieces, for work-boxes, and other articles in which it is desired to combine utility with ornament. Its lightness occasions it to be also frequently used in the manufacture of musical instruments. The sap of the maple contains a certain quantity of saccharine matter; but two of this genus (*acer saccharinum* and *acer nigrum*) yield so abundant a supply as to have obtained for them the general designation of the sugar-maple. The former of these trees is found in North America, between the 42nd and 48th degrees of latitude,—that is, in the northern parts of Pennsylvania, the western portion of New York, in Upper Canada, Nova Scotia, and the northern parts of New England. The *acer nigrum*, or black maple, flourishes in rather a warmer climate, and is most abundant on the banks of the Ohio and the great rivers of the western states of America. These trees furnish excellent fuel, and the ashes are manufactured into potash. The maple is not surpassed by many trees in the variety of purposes in which it may be usefully employed.

The 'Encyclopædia Americana' states, that maple-sugar could be manufactured in sufficient quantities to supply the consumption of the United States; but, of course, without any intention of insisting upon the advantage of affording national encouragement to this domestic manufacture. In the newly-settled parts of

the United States, and in Canada, where the inhabitants are often placed at great distances from each other, and the opportunity of effecting exchanges is very imperfectly enjoyed, domestic manufactures of various kinds may be wisely undertaken, to engage in which would obviously be mere waste of time in a different and more advanced state of society. Accordingly, we find that, even in those districts of America where the sugar-maple abounds, it is only in remote parts of the country that its manufacture forms a regular branch of rural economy, and where a reserve is made by settlers of from 200 to 500 maple-trees for a "sugary."

The sugar is said to equal the common brown sugar of the West Indies, and, when refined, to yield to none in purity and sweetness. The produce of a single tree appears to vary considerably, by some it is said to amount to five or six pounds, and by others it is estimated as high as thirty-three pounds per tree; but this amount can probably be obtained only under a concurrence of peculiarly favourable circumstances, and in the southern states of America; for in Canada the average produce of the season from one tree is stated by Evans, in his 'Emigrants' Directory and Guide to the Canadas,' to be not more than two pounds. The sugar is worth from fourpence to sevenpence halfpenny per pound. Two men can attend to 300 or 400 trees. A family may even make 1000 lbs. of sugar in the course of a season, which commences towards the end of March, and lasts a month; and fortunately happens at a period when agricultural labours have not resumed their activity.

The following account of the process of sugar-making is taken from Evans's 'Emigrants' Directory,' quoted above:—"A large gouge, or hollow chisel, should be provided, and a piece of dry pine or cedar got, and cut into lengths of about nine inches each. These pieces should be split into bolts, about an inch thick, the breadth of the gouge; and these bolts again split up with the gouge about a quarter of an inch thick, by which they will become hollow spouts, like the instrument with which they are cut, for the sap to run in: they should then be pared with a sharp knife at the end, to the shape of the edge or point of the gouge, so that when it is driven half an inch or so into the tree, the spout also may be driven into the incision, and fit it tightly. Troughs, to receive the sap as it falls from the spout, are made of pine, fir, or ash, and being split into two, each half piece is hollowed out with an axe, so as to contain about two gallons. Each tree of ordinary size will require one, and very large trees two troughs. Buckets, which cost about tenpence each, save much more of the sap than the troughs. A tree will run about a bucket-full per day, on days succeeding frosty nights with a moderately warm sun to thaw the sap.

"After all these have been prepared, one or two of the troughs being placed under each tree, the person holding the spouts, gouge, and an axe, makes with the corner of the axe a small sloping notch about an inch and a half long, and deep enough to penetrate into the wood of the tree about half an inch; the under side of the incision being cut sloping down into the tree, so that the sap may run to its lowest point: if fit to tap, the sap is seen immediately to ooze from the cut. About an inch under that, the gouge is driven in for the spout as before directed, through which the sap is conveyed down till it drops into the bucket or trough at the foot of the tree, the cut being almost two feet from the ground: one man can thus tap about 200 trees or more in a day. One tapping generally answers for the season, and the trees, if not greatly hacked, will do for a sugary many years."

The sap is collected daily and carried to the boiling-place, when it should be put into puncheons or barrels; or large logs, hollowed out, will, in case of need, serve the same purpose. Mr. Evans gives the following directions to be attended to in the process of boiling:—"Two stout crotches are fixed upright in the ground eight or ten feet asunder, and on them is placed a cross stick from which pots or kettles are hung; a crook to hang them by being made of a crooked piece of wood. The fire is made underneath of split or small wood between two larger logs rolled on each side. The sap should be strained into the boilers, and when boiling down, one boiler should be kept filled from the other, and that again supplied from the others till the liquid be boiled down to the consistency of syrup. It is then taken up and strained into a deep narrow vessel, where it is left to settle for a day or two. When about being sugared off, it is carefully poured from the sediment into a small boiler, and again hung over a slow fire; a little milk, or a couple of eggs beat up, being put in to clarify it: as it boils it is skimmed, and, after boiling about an hour to a proper consistence, it is poured into vessels to cool, and stirred occasionally till cold. The best mode is not to boil it too dry, but to pour it into a barrel after boiling sufficiently, and when cold the sugar begins to crust on the surface in a day or so; after which, by having a few gimlet-holes bored in the bottom of the barrel, the molasses will run off, and leave after it a clean fair sugar. To prevent the sap or syrup from boiling over, about an inch square of fat pork should be thrown in once or twice a day, and it will be found to have the desired effect. The scum, sediment, and last run of the sap from the trees which is not good for sugar, should be boiled together, one-half down; and, being barrelled, will, by allowing it to ferment, make good vinegar."

THE SALT-MINES OF SALZBOURG.

The following account of a visit made by three French gentlemen to the salt-mines near Salzbourg, in the Austrian dominions, is abridged from a work entitled 'Voyage d'un Français aux Salines de Bavière et de Salzbourg,' in 1796; and a gentleman, who has recently visited it, assures us the description agrees exactly with its present state.

The salt-mines are at a little distance from the small town of Hallein, and at the foot of the Durenberg mountain. We seated ourselves in sledges, and were conveyed to the opening which leads into the interior of the mine. Before descending into the mine we equipped ourselves in the costume of the miners, which consisted of flannel waistcoat and trowsers, and a large white cape for the shoulders. These preparations are rendered necessary by the extreme humidity of the mine, which would effectually have destroyed the common articles of clothing. We were also supplied with strong shoes, a leather apron, and a hood. We then seated ourselves on a sort of wooden horse called a 'wurst,' which moved on four small wheels. Three of the miners attached the traces of this machine around their waists, and dragged us slowly through a long gallery, on each side of which was an aqueduct constructed of wood. One of these conveyed a supply of fresh water into the mine, and the other carried it off when it had become sufficiently impregnated with salt. In a quarter of an hour we reached the first shaft. It is not dug in a perpendicular direction, but inclines at an angle of about 45°. It was along one of these that we were to descend to a depth of about eighty yards.

The descent is effected in the following manner:—Two round and smooth beams are placed side by side on the lower part of the shaft, about a foot asunder. They somewhat resemble the machine used by brewers for lowering beer into cellars. They are fixed, and extend

from the entrance to the bottom of the shaft. Upon these beams the person descending seats himself, placing his legs over each side, and thus slides to the bottom. A great rope is stretched on the right, about the height of the arm, in order to enable those who are descending to regulate the rapidity of their descent. One of the miners preceded each of us in the descent. My attendant placed himself between my legs, at the same time cautioning me neither to move my arms nor feet. The men then asked us if we were alarmed? to which, of course, we courageously replied in the negative. Then, abandoning ourselves to the impulse of our own weight, and each of us holding in one hand a burning torch, we glided forward so rapidly, that we were at the bottom of the "rolle," or beam, in half a minute. We then proceeded along another gallery, similar to the one at the entrance of the mine; and descended still deeper into the mountain by two other rolles, on which, profiting by my previous experience, I kept my seat without assistance. This mode of descending was both easy and pleasant, and I even regretted that the fourth rolle was the last.

The mountain, within whose bosom we now were, is composed of a sort of rock-salt, which is in a constant course of growth or formation. The first excavations appear to have been made at a period so remote, that tradition has not even preserved any records of the date at which the working of it was first commenced. These excavations consist of chambers six or eight feet square, into which water is conveyed by means of the aqueducts before-mentioned. The water enlarges these chambers by dissolving gradually the walls and roof. They are generally about six feet in height, and are filled as nearly as possible with water. If the chamber were half filled with water, the sides only would be submitted to the process of soluiton, but, by being very nearly filled, the water attracts the saline matter contained in the roof, and the operation is carried on in the most rapid, and at the same time effective, manner. The miners term the roof of the chambers the "ciel."

The rock-salt is of different colours, but blue, grey, and yellow are the most common. Frequently it is friable, and sometimes slaty, and peels off in transparent cakes—resembling the tracery work produced on a window by frost. There is often found, in a chamber of 613 yards in circumference, seven or eight masses of slaty rock three or four feet in diameter, which do not contain any salt whatever. Of course these masses resist the direct action of water, but, as all the parts round them containing salt are gradually dissolved, they are in the end detached from the roof and deposited on the floor. We saw several of these in one of the chambers we examined. The water had been drained out of this chamber three weeks before, and it was illuminated with about fifty candles. One of these masses, like a shapeless column, reached from the floor to the ceiling; some, on being detached, had left cavities two or three feet deep, and several were still suspended. The miners pass carelessly under them. But that which caused me most alarm was to find myself under a ceiling 584 yards in circumference, on which the weight of the superincumbent mountain rested, and which was not even supported by the vaulted form which nature usually gives to the roofs of subterranean caverns. It was perfectly flat, and was only sustained by the adhesive forces which existed between all the various parts of this immense apartment. The firmness thus occasioned is so great, that only one instance has occurred during several centuries of a ceiling having given way.

There are thirty-three chambers excavated in the mountain. They are partly shaped by the action of the water, and their dimensions are irregular, according as the mass composing the roof or walls is more or less charged with salt. Many chambers are excavated one over the other, thus forming different stories, the mass which separates one chamber from another serving the same purpose as boards and lath and plaster in houses, though of course much thicker. The miners informed us, while we were examining one chamber, that above us was a chamber at that time filled with water. It may appear singular that a large body of water thus situated should not find its way into the apartment beneath, but we found the ceiling scarcely humid. The reason of this is, that before the water is introduced, the floor is covered with clay, which is beaten down so as to render the surface impervious to the water. A kind of blue clay is used for this purpose, which is worked up into a proper consistence with wooden mallets; and when it no longer contains any rough particles it is spread over the floor. If it should leak, a little saw-dust is thrown into the water, and by this means the position of the outlet is ascertained, which is first of all enlarged, and then securely plugged with the clay cement. If the water escapes by one of the galleries, the gallery is abandoned to a certain distance, and endeavours are made with the cement to repress the passage of the water as much as possible. If this fails, however, it becomes necessary to open another gallery, and this is the most difficult task which the miners are called upon to perform. In executing this work they are obliged to divest themselves of every article of dress; as, without this precaution, their clothing would absorb a strong saline composition, which would render it hard and brittle, and cause it to tear the skin. I could not think without compassion of these unfortunate men being thus employed for nine hours a-day for so small a recompense as twelve kreutzers (4*d.* or 4½*d.*) The men are relieved every three or four hours when thus occupied; and from the hardships they undergo they are not long-lived.

When the water in the chambers is sufficiently impregnated, it is drawn off. When it is entirely withdrawn, the ceiling is found to have increased about two feet in height; but at the same time the floor is raised two feet by the fallen materials. By this means the necessary degree of thickness is maintained between one chamber and another. Two chambers situated one above another are by this process in a gradual course of ascension, so that the lower one occupies the same elevation in about eight or nine years, which was previously held by the one above it. The saline matter, of which the ceiling is composed, is dissolved, and the other parts are deposited on the floors. The materials thus deposited, although destitute of any saline particles, in the course of time acquire the qualities of rock-salt,—a process which promises to render the mountain at Hallein a perpetual source of riches.

Care is always taken that two neighbouring chambers are not placed on the same level, as the lateral pressure of the water might open a communication between them. When a chamber has been made use of, it is necessary to raise the gallery leading to it, the deposits which have taken place having made the floor about two feet higher than before. On this account a chamber is only used once in three years.

A remarkable instance of the growth of a saline rock may be seen at Hallein. In forty years it has encroached about three feet on each side of the gallery, a wooden trough, which runs through the centre, offering a resistance to it in that part which it has been unable to overcome. Each of the galleries, and the aperture by which it is entered, has its separate name, as well as each chamber. The gallery named Wolf Diedrich is so called after one of the prelates who filled the archiepiscopal see of Salzbourg, a man of great firmness of

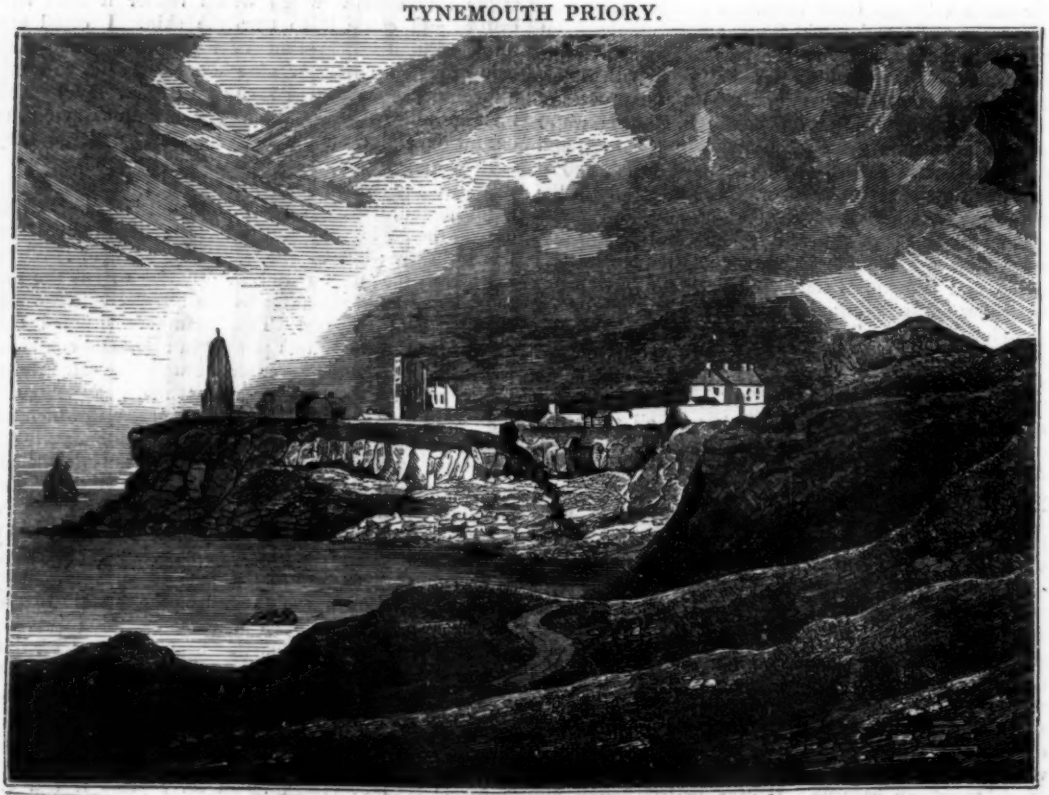
character and strength of purpose, as will be seen by the following account of the Wolf Diedrich gallery, which was dug in a part of the mountain which had not previously been penetrated. This gallery was absolutely necessary as an outlet to the water after it had become impregnated with salt, but the only side of the mountain on which it could be executed consisted of the hardest description of marble or granite, and, according to the plan of Wolf Diedrich, it was necessary to penetrate through 1578 yards of this material. Objections were made on the ground of the expense of such an undertaking and its probable impracticability; but he persisted, in spite of these unfavourable opinions. The ordinary implements being found of a temper too soft for the purpose, he caused them to be made of steel, but still they only struck from the rock particles as small as dust. Wolf Diedrich hoped with all the strength of perseverance. "If we only succeed in obtaining dust," said he, "we shall in time penetrate into the heart of the mountain." The work was carried on in opposite directions, one party commencing on the outside of the mountain, and the other in its interior, and was continued in this manner during fifty years. The mountain engineers who directed the labours of the workmen, guided their course with such precision, that the two passages opened into each other at the place appointed for their junction. There was, however, some error in the levelling, arising from their having neglected the rules on which they had at first proceeded, and being guided, on the near termination of the work, by the sound of their tools. The sound deceived them, and the error which they made is still visible. This gallery is about a yard broad, and nearly five feet high. It is divided into sixteen stations, where recesses are made, into which, when two *wursts* meet, one of them can be withdrawn to allow room for the other to pass. The inclination of the gallery is about an inch in two yards.

We were afterwards conducted into a chamber, the walls, floor, and ceiling of which consisted entirely of salt. Fifteen of us entered this apartment, the appearance of which, when illuminated by our torches, was very extraordinary. This is a sort of council chamber of the miners, where the superintendents are received when they pay their annual visit.

The following is the extent of the mine:—length 2012 yards; depth 314 yards. The expenses of maintaining it in a proper state for working are not great, owing chiefly to the wood which is made use of becoming so thoroughly impregnated with salt as not to require renewal. The pernicious gases which are found in coal and other pits are occasionally generated in these works, but not to such an extent as to produce disastrous consequences. The water at times occasions considerable damage.

We spent three hours in the heart of the mountain; the air is neither hot nor cold, but of a mild and equable temperature. We proceeded out of the mine by the marble gallery of Wolf Diedrich, seated on a *wurst* drawn by the miners.

TYNEMOUTH PRIORY.

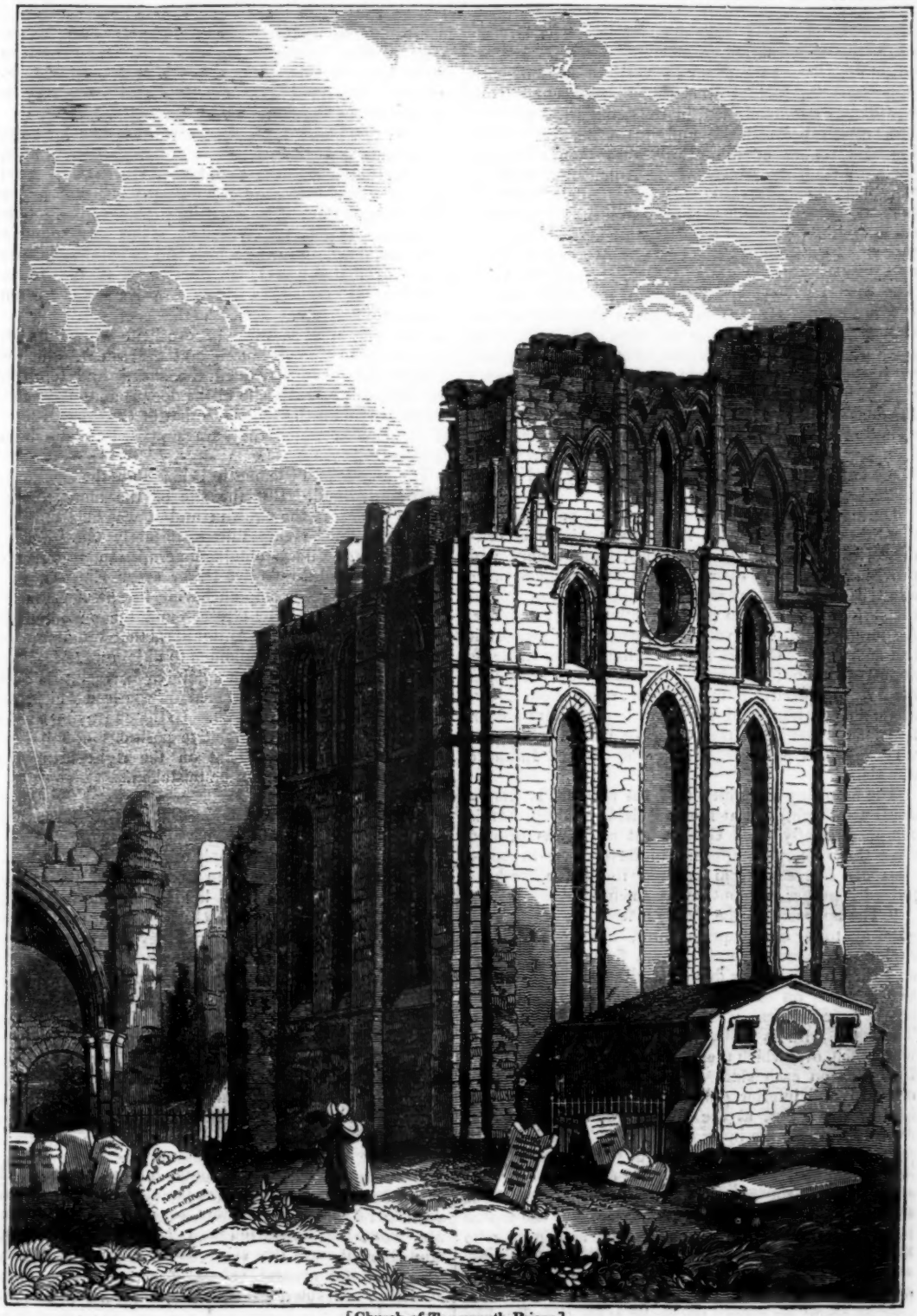


[Tynemouth Cliff, with the Lighthouse, Priory, and Barrack.]

This old ruin is situated in Northumberland, and stands on a peninsula, formed of stupendous rocks, on the north side of the mouth of the river Tyne, and to the east of the town of Tynemouth. It is of very remote antiquity—earlier than the eighth century; but no authentic record appears to exist respecting its original foundation.

The choice of the situation, however, appears to have been dictated by two motives, security and gain. "The exalted height," says Grose, "on which the monastery stood, rendered it visible at sea, a long way off, in every direction, where it presented itself, as if reminding and exhorting seamen in danger to make their vows, and promise masses and presents

to the Virgin Mary and St. Oswin." Thus, therefore, though during stormy and inclement weather the situation must have been very unpleasant, yet in those unsettled and credulous times it afforded the advantage of presenting to the eye of the sailor in distress an object towards which he could direct his prayers and bend his course, and also an outpost from which a hostile armament might be descried, and an alarm communicated. Neither its utility nor sanctity, however, could preserve it; for in the infancy of the establishment it suffered greatly by the incursions of the Danes, by whom, as the old chronicles state, it was thrice plundered, the church at one time being burned to the ground. Tosti, Earl of Northumberland, in the reign of Edward the Confessor, is said to have rebuilt and endowed the Priory for Black Canons, dedicating it to the honour of the Virgin Mary and St. Oswin, the remains of that Saint having been found among the ruins.



[Church of Tynemouth Priory.]

That the situation, at the mouth of a river, and on an elevated site, early recommended the place as suitable both for military defence and religious purposes, is evident from the fact that Robert de Mowbray, about the year 1090, fled hither, and defended himself within its walls against William Rufus, (against whom he had conspired;) but, after a time, finding that he could hold out no longer, he sought "sanctuary" at the altar of the church, from which, however, he was taken by force, carried to Windsor, and, after suffering a tedious imprisonment, was put to death. The monastery at one time enjoyed considerable wealth. It possessed twenty-seven manors in Northumberland, with their royalties, besides other valuable lands and tenements. At the dissolution, in 1539, there was a prior, with fifteen prebendaries and three novices. The annual revenues of the priory were then estimated (separate from the Abbey of St. Alban's, on which it depended) at 397*l.* 10*s.* 5*d.* by Dugdale, and at 511*l.* 4*s.* 1*d.* by Speed. The prior, on the surrender of the monastery, received a pension of 80*l.* per annum. The site and most of the lands were granted in the 5th of Edward VI. to John Dudley, Earl of Northumberland; but by his attainder in the next year it reverted to the Crown, in which it remained till the 10th of Elizabeth. During the reign of Elizabeth the place was occupied as a fortress, as in a statement given by Peck, in his 'Desiderata Curiosa,' of that queen's expenses, civil and military, Tynemouth Castle is set down as having a master gunner at the "fee per diem" of 8*d.*, and six inferior gunners at 6*d.* a-piece. Camden, quoted by Grose, says, "It is now called Tinemouth Castle, and glories in a stately and strong castle."

During the civil war it was besieged and taken by the Scots, in 1644, when thirty-eight pieces of ordnance, and a large store of arms, ammunition, and provisions fell into their hands. The garrison were allowed to march out with their baggage, but bound themselves to submit to the instructions of Parliament. A sum of 5000*l.* was voted to repair the damages it had sustained. Colonel Henry Lilburne was made its deputy-governor; but having declared for the King, Sir Arthur Hazelrig immediately marched from Newcastle against him, and stormed the place with almost ferocious bravery, the men entering the fortress at the very cannon's mouth. During the assault Lilburne was slain.

The following description of the remains is from a small work published at North Shields in 1806. It is compiled chiefly from Grose; but as it was printed near the spot, and appears to have been in some instances corrected from personal inspection, we have judged it proper to adopt its statements:—

"The approach to the Priory is from the west, by a gateway tower of a square form, having a circular exploratory turret on each corner; from this gateway, on each hand, a strong double wall has been extended to the rocks on the seashore, which from their great height have been esteemed in former times inaccessible. The gate, with its walls, was fortified by a deep outward ditch, over which there was a drawbridge, defended by moles on each side. The tower comprehends an outward and interior gateway, the outward gateway having two gates, at the distance of about six feet from each other, the inner of which is defended by a portcullis and an open gallery; the interior gateway is, in like manner, strengthened by a double gate. The space between the gateways being a square of about six paces, is open above to allow those on the top of the tower and battlements to annoy assailants who had gained the first gate.

"On passing the gateway, the scene is strikingly noble and venerable; the whole enclosed area may contain about six acres; the walls seem as well calculated for defence as the gateway tower; the view is crowded with august ruins; many fine arches of the priory are standing. The most beautiful part of these remains is the eastern limb of the church, of elegant workmanship. The ruins are so disunited, that it would be very difficult to determine to what particular offices each belong. The ruins which present themselves in front, on entering the gateway, appear to be the remains of the cloister, access to which was afforded by a gateway of circular arches, comprehending several members inclining inwards, and arising from pilasters. After passing this gate, in the area many modern tombs appear, the ground being still used for sepulture. The west gate entering into the abbey is still entire, of the same architecture as that leading to the cloister. The ground, from the cloister to the south wall, is almost covered with foundations, which, it is presumed, are the remains of the priory. Two walls of the church are standing; the end wall to the east contains three long windows; the centre window, the loftiest, is near twenty feet high, richly ornamented with mouldings, some of which are of rose work, and others of the dancette, as the figure is termed in heraldry, or zigzag, a decoration common to old Saxon architecture. Beneath the centre window at the east end is a doorway of excellent workmanship, conducting to a small but elegant apartment, which is supposed to have contained the shrine and tomb of St. Oswin. On each side of the door is a human head, cut in a style much superior to that of the general taste of the age in which they are supposed to have been executed."

The manor of Tynemouth belongs to the Duke of Northumberland. But the site of the monastery is said to belong to the Crown; and it was held under a lease by Colonel Henry Villars, formerly Governor of Tynemouth. Villars obtained permission to erect a lighthouse, and to receive 1*s.* for every English, and 6*d.* for every foreign ship anchoring in the harbour of Shields. It is stated by Grose,—and the statement is repeated in the 'Border Antiquities,' that Villars pulled down many of the old buildings to obtain materials for erecting the lighthouse, an adjoining barrack, his own house, &c., and that he stripped off the lead which, till then, had covered the church. In the engraving at the head of this article, the relative positions of all these buildings are shown. That on the right being the barrack, the others cannot be mistaken.

MINERAL KINGDOM.—Section XXXVI.

Gold—(*continued*).

Gold Mines.—The chief supply of gold, for the last two centuries and a-half, has been from South America and Mexico. When Columbus landed on the Island of Hispaniola, in the year 1491, he found the natives wearing ornaments of gold; and they offered gold-dust in exchange. The natives of the coast of Carthagena, and of the Isthmus of Darien, had also many ornaments of this metal, some of which were very massive. But from the first discovery of the New World to the year 1519, when Cortez landed in Mexico, the quantity of gold and silver brought to Europe, according to the estimate of Humboldt, did not exceed 52,000*l.* The wealth in the precious metals which Cortez and his followers found in the possession of the chiefs, as they advanced into the interior, shows that the Mexicans must have made some progress in the art of mining before their country was visited by the Europeans. The Spaniards were struck with astonishment at the quantity of gold and silver which they found in common use, both for ornaments and for utensils. Pizarro landed in Peru in the year 1527; and he also found gold used for ornaments, and for vessels of various kinds, in considerable quantity. Mines had been wrought for the Incas, and the ore was smelted in

small portable furnaces of baked clay, in a manner the most rude; the heat being urged by exposing the furnace, in an elevated situation, to the blasts of heaven, shifting its position according to the direction of the wind, or increasing the heat by men blowing through long tubes, with a small orifice at the end next the fire.

Gold Mines of Mexico.—Mexico comprehends all that part of North America which extends from a line drawn between the Bay of Honduras on the east to the Gulf of Tehuantepec, in the Pacific, forming the southern boundary, to the 38th degree of north latitude, and having the state of Louisiana on the north-east. The veins of gold are contained in the primary stratified rocks (gneiss and mica-slate) in the province of Oaxacas, towards the south; and the porphyries, which are of frequent occurrence, are in general rich in veins of gold and silver. The grauwacke-strata are also rich in the precious metals, as in the province of Zacatecas; and some mines, as at Real Catorce, are wrought in a secondary limestone, considered by Humboldt to belong to the same age as the magnesian limestone of England (L, diagram in No. 51); and, what is very remarkable, even in a much more modern secondary deposit, of the age of our oolite series (I), as in the famous mines of Tasco, in the province of Mexico. The principal silver-vein in the rich gold-mine of Villalpardo, near Guanaxuato, is traversed by a great number of small earthy veins, so rich in gold, although the metal is not visible, that, in order to prevent fraud, the miners are made to bathe in a large tub, when they come out of the mine. Almost all the silver of Mexico contains gold; and generally in sufficient quantity to make it profitable to extract it. Stream-gold is also found in many of the alluvial deposits of Mexico, as in the province of Sonara, on the west coast, bordering on the Gulf of California, where masses of five and six pounds weight have been met with. But all the gold of Mexico is not equal to a twentieth part of the silver it produces. Upon an average of the latter years of the last century, the annual produce of Mexico in gold was estimated to be about 517,775 troy ounces, or about 200,000*l.* in value. There is no reason to suppose that the produce has increased since that time, but rather the contrary, on account of the political revolutions to which the whole country has been subjected for the last twenty-five years, and which must have caused great interruptions to industry and to commercial enterprise.

Gold Mines of South America.—Beginning with the western side of the continent, "the most considerable gold-mines of Chili are in the district of Petorca, north-east of Valparaiso; and, farther to the north, in the districts of Coquimbo and Copiaba. In Peru, the provinces the most rich in gold are those of Pataz and Huailas, between the seventh and ninth degrees of latitude, and situated in the ridge of the Andes. The Incas obtained vast quantities of gold from the plains of Curimayo, north-east of the city of Caxamarca, at an elevation of more than 11,000 feet above the sea; and in the Cerro de San José, at a height of 13,000 feet, considerable quantities of gold have been found in veins of an ore of silver. Very extensive and productive stream-works are situated on the banks of the river Tipuani, not far from the town of Zorata, eastward of the great lake of Titicaca, and which appear to have been worked by the early inhabitants of the country, for ancient Peruvian tools are sometimes found in the soil. There are veins of gold in mica-slate in the province of Antioquia, in Colombia, but there are no mines worked there, on account of the inaccessible nature of the country. All the gold of New Granada is obtained from the alluvial soils, and the richest stream-works are in the provinces of Antioquia and Choco, in the valley of the river Cauca, and on the coasts of the Pacific in the district of Barbacoas; but the auriferous alluvium extends over the whole country from the western Cordillera of New Granada to the sea-shore."—(*Penny Cyclopædia*, article ANDES.) The annual produce of the gold-mines and stream-works of South America, exclusive of Brazil, is stated by Humboldt to have amounted, at the beginning of the nineteenth century, to 283,429 troy ounces; which, valued in its refined state, at 4*l.* per ounce, is equal to 1,133,716*l.* The produce of Chili has, however, greatly fallen off;—from about 12,000 ounces, in 1810, to 2220, in 1830.

When Brazil was first discovered, gold was in such common use that the inhabitants had fish-hooks of that metal, but had no iron, although their country abounds in it. The district in which gold is now obtained in greatest quantity is in the mountainous part of the province of Minas Geraes; but it is also got in the provinces of Goyaz, Matto Grosso, and San Paolo. It occurs in veins in primary clay-slate, limestone, and granite; and the iron-ore with which those districts abound is also frequently auriferous: but the most fertile source of supply is the stream-gold in the deep alluvial soils which cover the primary rocks. The gravel and sand are washed, and the heavier gold is separated by a process similar to, but less skilful than that followed in the tin stream-works of Cornwall. Mr. Jacob estimates the produce of the gold-mines of Brazil to have been equal to 80,000,000*l.* sterling in 110 years, ending in 1810; but it has been gradually declining, he says, since the middle of the last century. Thus, the average annual produce from 1752 to 1762 was about 950,000*l.*; from 1785 to 1794 it was about 415,000*l.*; and, in 1810, the mines of Minas Geraes, which afford three-fourths of the whole produce of Brazil, yielded only about 205,000*l.* In the subsequent ten years, there must have been an enormous decline, if the statement of Major Von Schäffer, who visited the country in 1822, be correct; for he says, in his work on Brazil, that the produce of the preceding year was only 24 arrobas of gold, which is equal to about 44,000*l.* If this account is to be relied on, then we have in Brazil, as in other countries, a proof of the extraordinary vicissitudes to which mining adventures are subject; for, in a letter of one Rafael de Amar, published in Leonhard's 'New Annual of Geology,' dated July, 1833, it appears that the gold-mines of Gongo Soco had, a short time before, produced 30 arrobas of gold in three months; and that the same mine had yielded above 100 arrobas in the preceding year: 100 arrobas are equal to 47,233 ounces, so that the value was about 188,932*l.*

Gold Mines of Europe.—The Ural mountains, which separate European from Asiatic Russia, yield the largest amount of gold that is now produced in any part of the Old World. The mines there have been gradually increasing since their discovery in 1819; and, in the year 1830, according to a statement by Humboldt in his 'Fragmens Asiatiques,' they yielded 355 poods of gold. A pood is equal to 45 pounds troy; and if we estimate the gold, in its refined state, at 4*l.* per ounce, we have a total value of no less a sum than 766,800*l.* The mines are situated on the eastern side of the mountains, and are almost wholly in alluvial deposits, that is, nearly all the metal obtained is from stream-gold. After the discovery of the stream-gold, several attempts were made to find the veins. One mine is now worked in the rock, at Beresof, 15 wersts, or 10 English miles, north-east from Katharinenburg; and another was opened at Newiansk, about 95 wersts, 63 miles, north of the same town; but it had been abandoned when Humboldt visited Siberia in 1829. The alluvial soil yields from 65 to 130 grains of gold in 100 poods, or 3600 pounds avoirdupois. Sometimes large lumps are found, one of which, met with within a few inches of the surface near Miask, in the southern part of the Urals, weighed nearly 330 ounces. The Russian government sent out, in 1832, four different expeditions, composed

of engineers and other properly-qualified persons, to traverse the Ural mountains in various directions. It is expected that, in seven years, a very complete geological map of the whole range will be completed.

Although the Russian mines are properly in Asia, we have considered them as belonging to Europe in this respect, for a considerable part of their produce is refined in Petersburgh. Gold has been long found in various parts of Europe, but the produce has declined considerably, when the average of the last twenty years is compared with that of the preceding hundred years. The only mines that are now of any importance are in Hungary, which a few years ago yielded, according to Brongniart, 20,900 ounces yearly, or about 83,600*l.* in value. The most celebrated mine is that of Nagyag in Transylvania, where the gold is in combination with tellurium; and there is a mine at Chemnitz where it is alloyed with silver, lead, and iron. Dr. Edward Brown, an English physician, who visited the Hungarian mines about the year 1760, says, that the mines of Chemnitz had been worked nearly 950 years, and were then the richest in gold in all the kingdom. But the chief supply is from the alluvial soils; and collecting gold in the beds of torrents and rivers is one of the chief occupations of the gypsies, the *Zigeuner*, who are so numerous in Hungary. Native gold is found in veins in the Salzburg Alps, and in the mine of Edelfors, in the province of Smoland in Sweden, but in small quantity. It is probable, however, that it was found at an early period in that country, for swords, daggers, and knives have been dug out of tumuli in some parts of Sweden, having blades of gold with a cutting edge of iron. Stream gold is found in a great many parts of Europe, especially in the beds of rivers, as in the Danube, Rhine, and several others connected with mountainous countries. That part of the course of the Rhine which passes through the territory of the Duke of Baden yielded to the government, in the year 1827-8, about 943*l.*, according to official documents which have been published; but it is seldom found anywhere in Europe in sufficient quantity to repay the labour of searching for it; and the gypsies and others who follow this trade are much worse paid by all they find than the commonest day-labourer; but the vagabond life, and the hope of meeting with a prize, even where the blanks are numerous beyond all proportion, have charms too exciting for the search to be altogether abandoned.

EXCHANGES.

In a tribe of savages, a discovery is made by one of them of a colouring substance, with which he stains his body. This adornment excites the envy of his companions;—each desires to ornament himself in like manner. But the inventor alone is in possession of the colour; what, then, will the others do to obtain it? There are but three means by which this may be accomplished;—violence, persuasion, and exchange. Violence is not always the most practicable means. Strength or address may be wanting; and even when violence is successful, reprisals may be anticipated. However brutal and unintelligent men may be in the infancy of societies, they soon recognise that it is the interest of all to prevent violence, and mutually to guarantee their possessions. Persuasion is a more effectual means; and even animals make use of it. When violence is out of the question, they endeavour to gain favour by their address. The infant caresses its mother; and the dog, which sits by the side of its master at dinner-time, endeavours, by a thousand wiles, to attract attention, and to obtain a morsel. In a prosperous state of society, persuasion is a very insufficient means. The wants of man become multiplied to such an extent, that it is a matter of difficulty to supply his own necessities. It is only the beggar who renders himself dependant on another; but even he depends only on a portion of his fellows. There remains, then, exchange as the means the most prompt, the most certain, and the most practicable, to procure that of which an individual is in want, and which he knows not how to procure by his own labour. The more prosperous society becomes, the more numerous become his wants, and he is less able to satisfy them by his own labour. It is then that he stands most in need of the assistance of his fellows; and it is in vain to expect it from their benevolence; it is much more effectual to address himself to their personal interests. This is what he does who proposes to make an exchange. The meaning of his proposition is this:—Give me that which I want, and you shall have from me that of which you yourself stand in need. It is not from the benevolence of the butcher, the wine-merchant, or the baker, that we expect to obtain our dinner, but from the care with which they serve their own interests. We do not address ourselves to their humanity. It is not of our wants which we speak, but of their advantage. Exchange begins from the moment when men possess a variety of exchangeable things. This last circumstance is absolutely necessary as the condition on which exchanges can alone be made; for if every body possessed the same thing, or if every one was without some particular article, or, in fine, if the articles which each possessed were not of an exchangeable nature, exchanges would then be impossible. Thus the condition above-mentioned comprehends three others, which it is important to explain. 1. Exchanges suppose the existence of property. An article which does not belong to any one cannot become an article of exchange. In the social state, everything which can be appropriated belongs to some one; consequently, it is only by means of exchange that individuals can procure that which they do not possess, or are unable to produce. 2. Exchange also limits itself to things capable of being transmitted. Only material things and human labour possess this capability. The first comprises the land and the productions of the three kingdoms of nature; the second the works of man formed or composed from these productions. 3. But to create exchange it is not sufficient that things should be exchangeable only;—it is requisite that they should exist in great variety. If the labour of each individual sufficed to satisfy all his wants, and if every bit of land produced all things, exchange would not be possible;—each individual would already possess that which another offered him. But happily it is not thus. Nature having connected the prosperity and civilization of the human race with exchanges, it has taken care to render them necessary and inevitable. The different dispositions that exist among men occasions their labour to be directed to varied objects; and the peculiar properties with which the earth is endowed produce likewise a diversity in its fruits. No man,—no country,—therefore, exists independent of another from the moment that artificial wants are awakened: all are forced to have recourse to each other, and thus all are compelled to exchange productions. The diversity of faculties causes the exchange of labour. In a tribe of hunters, all have an equal want of food, bows and arrows, &c.; but all have not an equal talent to pursue game, to make arms, to build huts, &c. In consequence, the skilful hunter furnishes game to him whose peculiar talent is particularly directed to a different occupation. Each labours according to his faculties. Each exchanges the labour which he is most skilful in performing against that which others perform better than he can do it himself. The more progress society makes, the more marked becomes the distinction in the various ways in which men employ their respective faculties. Wealth, habit, and education create an immense distance between men who, by their natural faculties, are placed on the same line. But this wealth and education would not have been possible without exchanges. Without them each would have been compelled to procure, by his own exertions, the means wherewith to satisfy his wants;—each would have had the same task to fulfil and the same labour to perform; and there could not then have taken place that great diversity of fortunes and occupations which alone give variety to the direction of men's faculties. It is thus seen that exchanges, which at first appear to be the effect of men's diversity of faculties, become also the cause of this diversity. The greater the amount of exchanges effected in a community, the more each individual is enabled to pursue that particular occupation for which he feels himself best qualified by disposition and taste—because it is then possible for him to satisfy all his other wants by exchange; and the more an individual confines himself to a particular employment, the more his talents for this occupation have the means of being developed and rendered perfect. — *Translated from Storch's Political Economy*, Vol. I., p. 67.

Printed by William Clowes, Duke Street, Lambeth.